Biomedical Informatics Research Network: Integrating Multi-Site Human Functional Imaging Acquisition and Analysis

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Introduction: The Functional Imaging Research in Schizophrenia Testbed BIRN is one of four test beds in the Biomedical Information Research Network (BIRN, www.nbirn.net). The BIRN is an NIH consortium comprised of 15 medical research institutions in the U.S. that aims to create technical infrastructure and guidelines to enable acquisition, databasing, sharing, analysis and mining of multi-institutional biomedical data. The FIRST BIRN focuses on the integration of multi-site functional MRI and clinical data, studying the brain activity of schizophrenic and normal subjects while performing certain tasks, to extend the ability to pool and compare data from functional imaging meaningfully. Challenges to this effort include calibrating data acquired from multiple sites, sharing human data according to federal regulations, integrating software analysis and visualization tools developed at different institutions, and developing data mining techniques in conjunction with data storage methods to allow novel combined analyses and interpretations.

Methods. The FIRST BIRN is a multi-site project with the following goals: 1) Standardized calibration of equipment and imaging activation paradigms using geometric and human phantoms; 2) Collection of fMRI data using a standardized protocol on populations of persons with schizophrenia at different sites, while including the added value of each site's own brain activation and analysis methods; 3) Combining fMRI data into a federated database, leading to a deeper understanding of the functional neuroanatomy of schizophrenia which would not be possible with a single site's data; and 4) Using data mining techniques to discover new relationships between brain structures. The eleven sites involved in the test bed have staff dedicated to determining an experimental paradigm, collecting calibration fMRI data, developing analysis methods, populating a virtual data grid, and designing a searchable federated database of MRI and clinical data from multiple sites.

Preliminary results. The unified efforts of researchers across institutions have resulted in novel approaches to human subject data sharing, experimental design, fMRI data calibration, and clinical and imaging database design. Issues related to the standardized collection, storage, and analysis of multi-site fMRI images will be demonstrated for data obtained on several sensorimotor calibration tasks developed for this purpose.